Multiple Indicator Monitoring of Streamside Livestock Grazing

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Five factors that affect aquatic species

- streamflow
- water quality
- energy source
- physical habitat structure
- biotic interactions

Overview of livestock grazing effects

- Livestock grazing effects to fish habitat -
  - Effects on vegetation adjacent to the stream (water quality, energy source, habitat structure)
  - Effects on the streambank – trampling
  - (water quality, habitat structure)

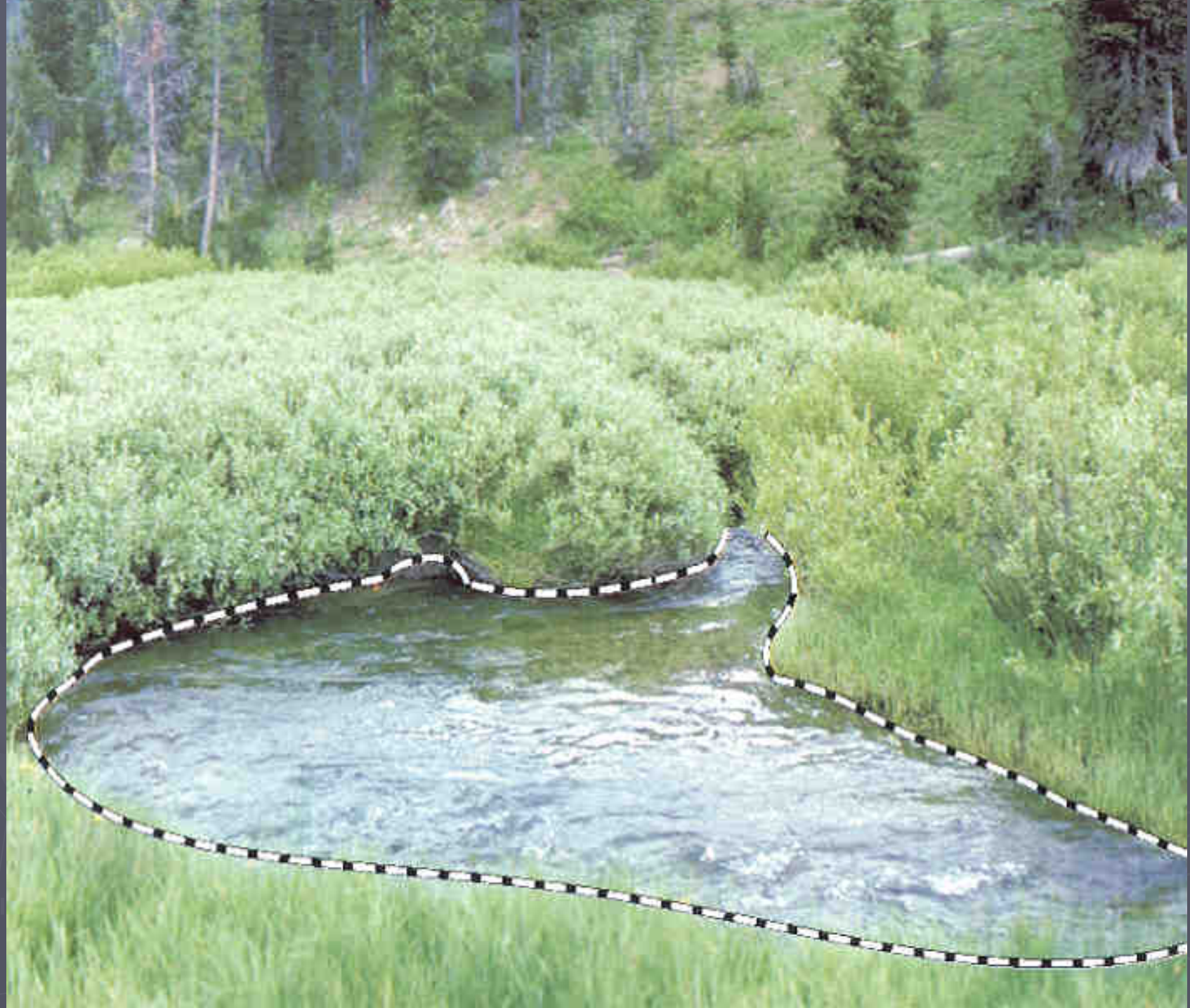
Surrogates for Livestock Grazing

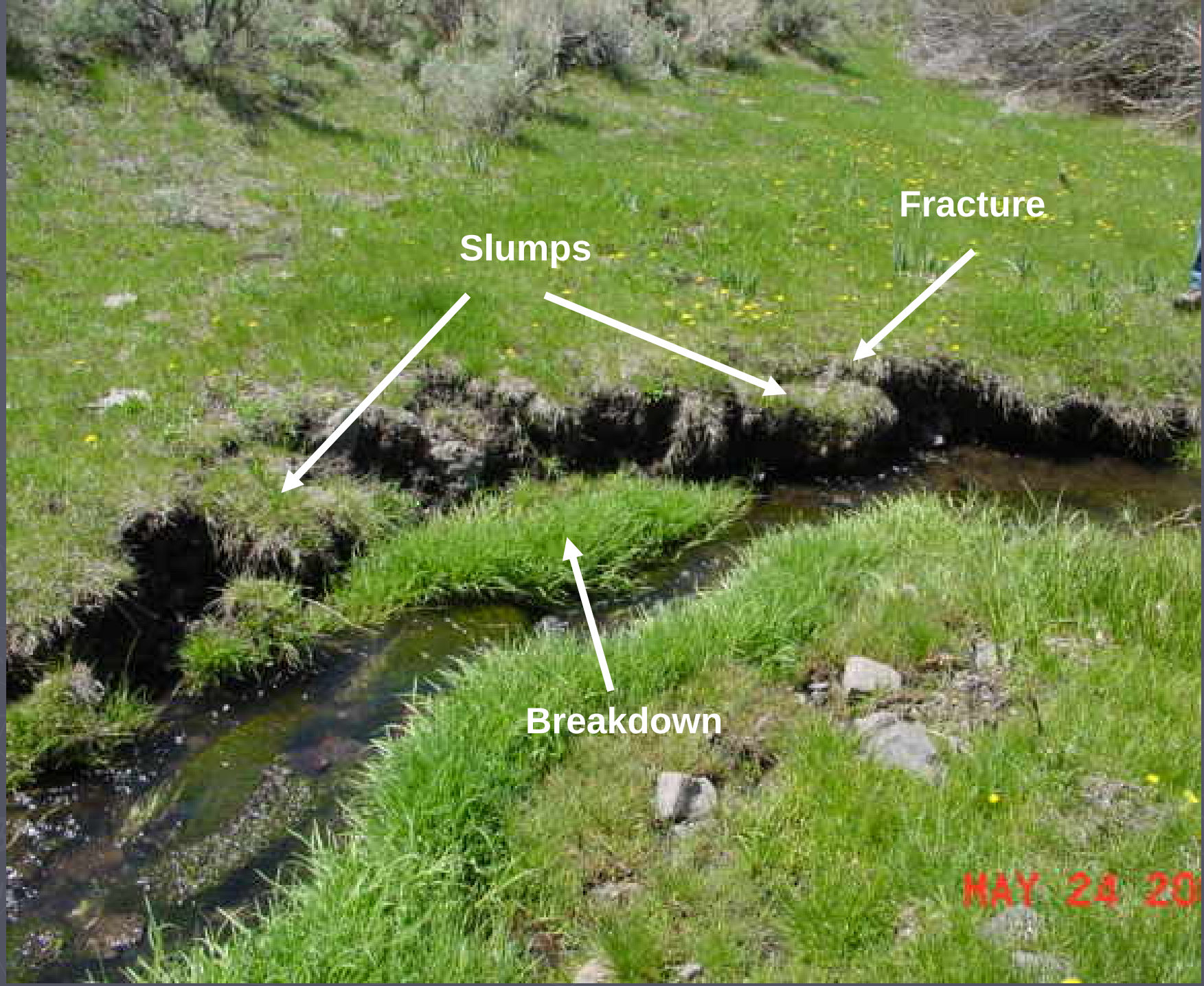
- Cost – effective
- Timely – indicative of impacts when they occur
- Reasonable level of precision

Grazing Surrogates

- Streamside vegetation -
  Along the "Greenline"

- Streambank stability -
  Along the stream margins




Fracture
Slumps
Breakdown
MAY 2

Pathways

Streamside vegetation cover and rooting → Overhanging vegetation, undercut banks, shade, submerged cover, etc.

→ Nutrient input → Primary productivity

Streambank stability → Narrower/deeper

→ Increased bank storage → Increased baseflows, Narrowed temperature Range, etc.

Indicators

- Streamside vegetation
  - Herbaceous vegetation
    - Stubble height – livestock use indicator
    - Greenline plant composition and health
  - Woody
    - Woody utilization – livestock use indicator
    - Greenline composition and regeneration

- Streambank stability
  - Streambank alteration – livestock use indicator

- Streambank stability

- For reasons of efficiency, past monitoring has focused only upon livestock use indicators, particularly –
  - Stubble Height

Why?

- Cost
  - Time/cost to sample using multiple methods
  - Protocol
    - Some methods require a lot of training (e.g. plant species ID)
    - Depending on the method, sampling occurs at different locations adjacent to the stream
    - Ease of sampling – stubble height is comparatively simple
    - Accuracy – stubble height is repeatable
    - Precision – requires relatively few samples

PROBLEM!

- Linkages between Stubble Height and Riparian function have not been adequately researched
- Useful only where herbaceous vegetation controls bank stability
- Is not always a good indicator of bank disturbance
- The standard must be based upon the growth potential of individual or groups of hydric species

What is Stubble Height ?

- Stubble height is **NOT** a riparian management objective, but an **indicator** of livestock use and potential impact.

- A measure of vegetation height remaining after grazing.

Stubble Height as a Criterion

- Based on limited research, the authors proposed a 10 cm residual stubble height as a "**starting point for improved riparian grazing management.**" However, they acknowledge that, in some instances, 7 cm may provide adequate riparian protection, and that in others 15 to 20 cm may be required to limit streambank trampling or to reduce willow browsing.

Stanley Creek Research Site

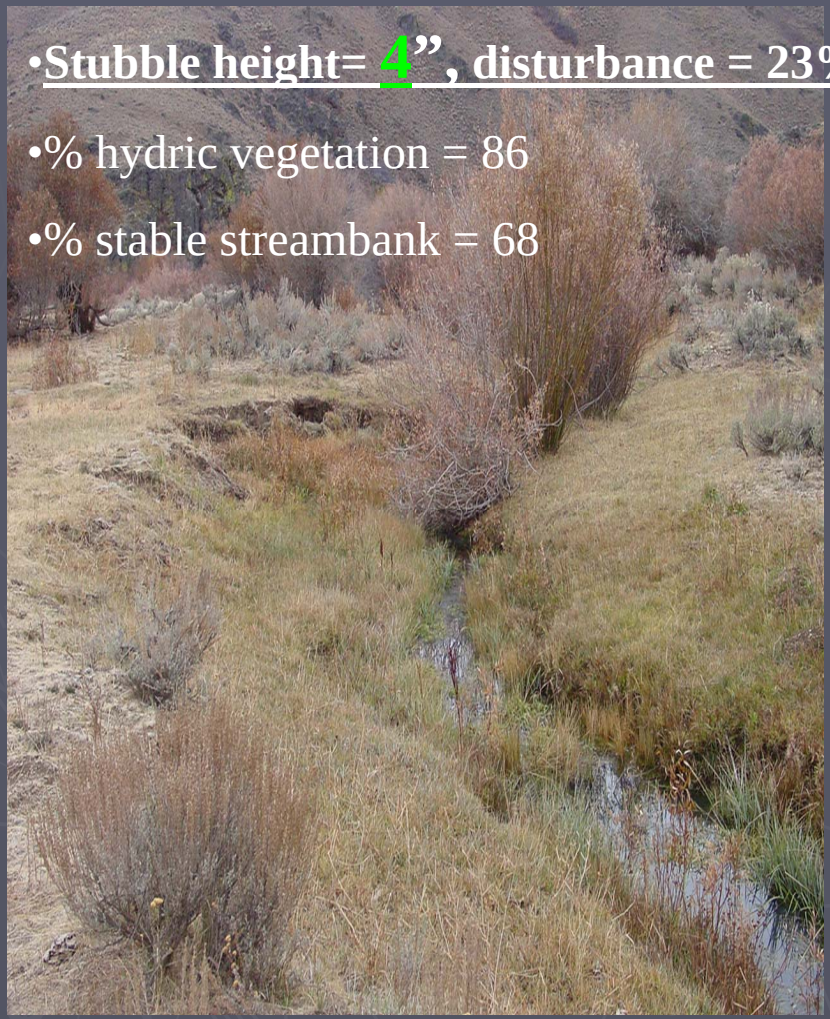
Appropriate Use of Stubble Height

"In combination with longer term monitoring of vegetation and channel parameters"

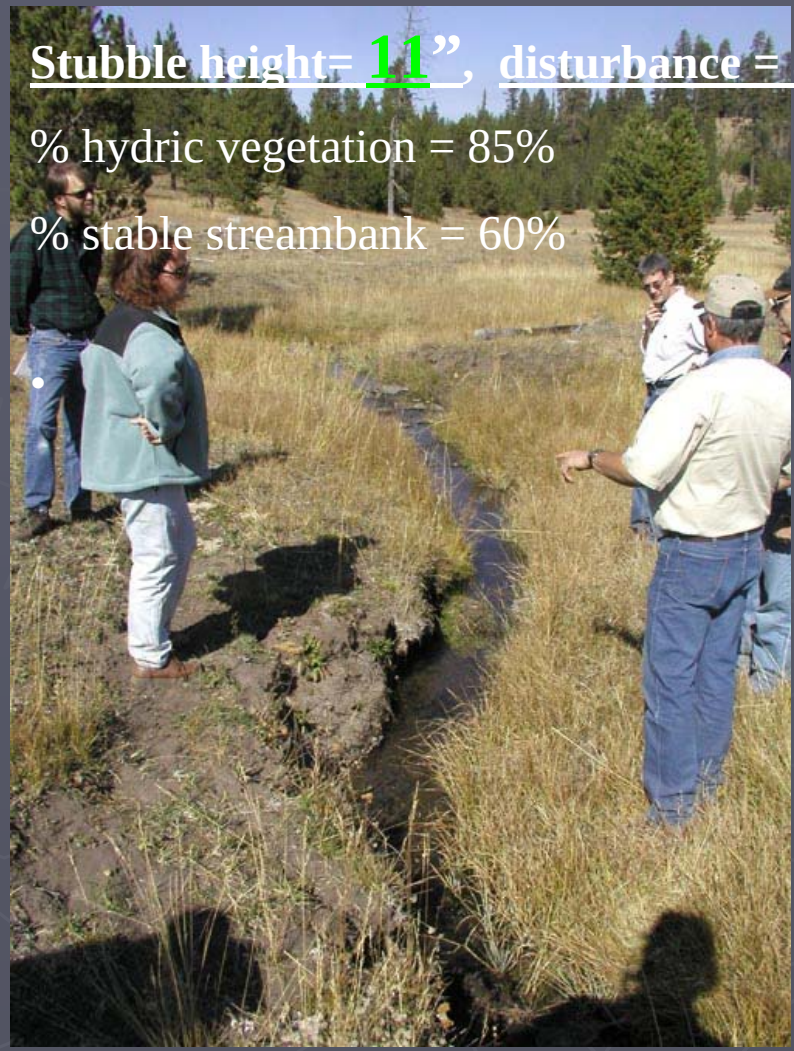
(U of I Stubble Height Study Team 2004)-

i.e. multiple indicators

Usefuleness of Multiple Indicators

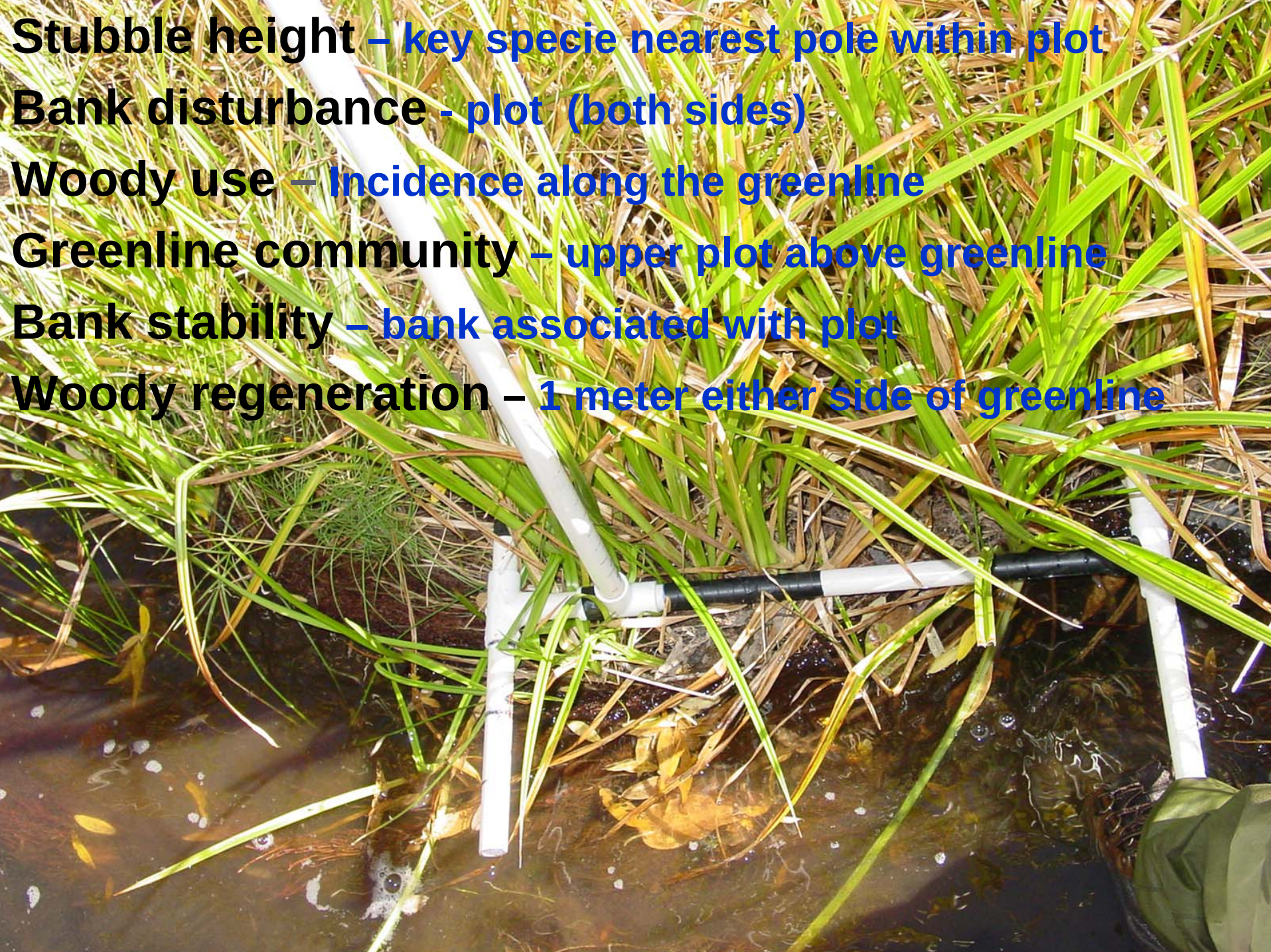


Stubble height reflects condition



Stubble height does not reflect condiition

Proposed approach: spaced quadrats along the greenline


Stubble height – key specie nearest pole within plot
Bank disturbance - plot (both sides)
Woody use – Incidence along the greenline
Greenline community – upper plot above greenline
Bank stability – bank associated with plot
Woody regeneration – 1 meter either side of greenline